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Dr. Frederick L. Wahrer (closing): In closing, I might say that I look at this question primarily as an otolaryngologist rather than from the point of view of physical therapy. I feel that physical therapy is an adjunct to the other types of treatment and that it should be used in conjunction with recognized therapeutic procedures rather than alone.

I would like to stress the fact that our first consideration is to secure ample drainage, and I feel that all of these cases should have preliminary shrinking of the mucous membranes. We will find in these cases of sinus infections that most of them are predicated upon the basis that the septum is deflected or has spurs or ridges which have mechanically blocked the nasal passages. Very seldom do we find these sinus conditions coming up unless we have a nose that previously has been mechanically blocked. There are some exceptions to that, but that will cover a very large percentage of them, and such being the case, with this sinus infection superimposed upon a previous mechanical blocking, we must enhance the short wave treatment by opening up the passage so that we can get drainage; otherwise, we may do more harm than good.



SHORT WAVE DIATHERMY IN NASAL SINUS DISEASE*

FREDERICK L. WAHRER, M.D.

MARSHALLTOWN, IOWA

In discussing this problem, I wish first to refer briefly to the difference between short wave diathermy and conventional diathermy. Short wave diathermy relates to the therapeutic use of high frequency oscillations ten to one hundred times the frequency of conventional diathermy. The wavelengths correspond to the short wave radio broadcast band of six to thirty meters. The application of short wave diathermy differs from diathermy in that there is no direct contact between the metal electrodes and the patient's skin, as short waves can pass through a spacing of air, glass, rubber, or felt, varying in thickness from one-fourth to three inches. The therapeutic effect produced by short wave diathermy is tissue heating, and particularly deep heating. Claims that certain wavelengths produce certain specific effects, or that certain biologic changes are obtained apart from that due to heat, have not been proved (Coulter and Carter).¹ Some authorities, however, believe that there is evidence to indicate that short wave possesses some distinct properties other than heat, and demonstrates biologic changes under different wavelengths (Kobak).²

The beneficial effect of heat in otolaryngology has been recognized for years. In the main it has been used mostly for the relief of pain, but its influence on inflammatory conditions soon became known, even though not fully understood. Within physiologic limits, the effect of local heat manifests itself by the appearance of external redness due in most part to an induced hyperemia. Independently of this reaction there is also a stimulation of the circulation of lymph, which under the prolonged influence of heat produces a localized edema. The well-known analgesic effects of heat are explained by these two phenomena, because they control infection through the very increase of the inflammatory process. Therefore we are justified in saying that inflammation is a natural defensive reaction which should be augmented rather than suppressed and that the therapeutic value of heat is due to hyperemia and hyperlymphia. Until the time of short wave diathermy, the main difference in the various heat producing agencies was one of convenience rather than superiority. The great value and advantage of short wave diathermy over conventional diathermy and other modes of heat is the fact that it creates heat at greater tissue depths than any other method. Hollender³ calls attention to the fact that the otolaryngologist has been particularly benefited by short wave diathermy. Though the bony structures of the head are especially difficult of penetration by long waves, they are easily passed through by short waves.

In my work, I have found it preferable to use a frequency of ten meters or less, due to the more adequate penetration of the deeper bony structures of the head. I also found it more convenient and efficient to use air spaced electrodes which are attached to movable or flexible arms or holders attached to the short wave apparatus. The ease of application of such electrodes to the uneven surfaces of the head renders this method the one of choice. In treating the frontal, ethmoid, and maxillary sinuses I prefer to place the air spaced electrodes parallel rather than to send the current through the head.

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I have found this method just as efficient, more easy of application, and less liable to produce overheating of the brain tissue.

It is my impression that short wave diathermy is most effective in the acute and subacute forms of sinus infection. I give daily treatments of approximately ten minutes' duration, not having found that longer treatments are advantageous. The relief of pain is usually prompt, and drainage is greatly improved. These are the two factors with which the patient and physician are most greatly concerned. The treatment generally gives sufficient relief to make the patient truly comfortable in a few hours, and a second treatment seldom fails to give complete freedom from pain. As a rule there is free and abundant drainage at the time of the first treatment. This becomes continuous and more copious for several hours after the treatment. There is no doubt that the course of the sinus disease is shortened by many days, which is important from an economic standpoint.

Combination With Other Methods

At this time, however, I wish to state most emphatically that short wave diathermy should not be used alone or to the exclusion of other therapeutic measures. Its greatest value is in connection with other established procedures, as an adjunct. Usually the bony structure of the septum or the turbinates is such as to block drainage of these cases. Added to this is the congestion and swelling of the mucous membranes. Under such conditions it is necessary to shrink the soft tissues of the nose in order to facilitate drainage. This is perhaps best achieved by some modification of the Dowling pack, and to apply the short wave treatment while these packs are in place. The packs are applied on wooden nasal applicators after having been saturated with a dehydrating, hygroscopic agent. I am more interested in these cases in dehydrating the water-logged mucous membranes, than in applying some type of antiseptic solution. It is quite important to shrink the soft tissues of the nose before applying treatment.

Jouard⁴ prefers to use athermic or mild short wave therapy in acute suppurative sinus conditions, especially of the ethmoids and frontals. He feels many good results are obtained with this type of treatment, without the danger that might attend the use of maximum deep heating in sinus empyema. Personally, I agree with Dr. Jouard, though in my experience the danger of short wave therapy in suppurative cases has been overestimated. Many patients receive sufficient drainage following a mild short wave treatment to obtain relief and avoid surgery. There is, however, good reason to caution against treatments at maximum intensity. In acute empyema of the antrum, I prefer to wash out the antrum by needle puncture, and secure drainage in this way. This is a fairly simple procedure and gives uniformly good results, if the puncture and drainage of the antrum is followed with short wave treatment, which enhances continued drainage.

My experience with short wave therapy in chronic sinus infections has not been impressive. Hollender⁵ states that while relief of symptoms is frequently noted, he doubts whether cures are obtained in these cases, especially with reference to the posterior sinuses. He believes that essentially the treatment of chronic sinus infection is surgical, and that no therapeutic measure can replace adequate surgical drainage in these cases. With this opinion, I heartily agree. Personally, I have never seen anything but temporary relief from short wave therapy in chronic cases. Sooner or later there is a recurrence of symptoms. I believe the greatest value of short wave treatment in chronic sinus infection is as a postoperative adjunct.

Summary

1. Short wave diathermy is especially important to the otolaryngologist because of its ability to produce deep heating in the bony structures of the head, which is not possible with the long waves of conventional diathermy.
2. Short wave therapy is especially efficient in acute and subacute sinus conditions, where it usually gives prompt relief from pain, produces adequate drainage, and materially shortens the course of the disease.
3. Short wave treatments should always be given in conjunction with other recognized therapeutic measures and are not self-sufficient.
4. Short wave therapy in chronic sinus disease may give relief in some cases, but the treatment of chronic sinus infection is essentially surgical.

References

1. Coulter, J. S., and Carter, H. A.: Heating of Human Tissues by Short Wave Diathermy, *J. A. M. A.* 106:2063 (June 13) 1936.
2. Kobak, Disraeli: Pitfalls and Dangers in Short Wave Diathermy, *M. Rec.* 145:373 (May 5) 1937.
3. Hollender, A. R.: Physical Therapeutic Methods in Otolaryngology, St. Louis, C. V. Mosby Co., 1937.
4. Jouard, Farel: Rationale of Short Wave Diathermy in Acute Sinusitis, *Arch. Phys. Therapy* 20:338 (June) 1939.
5. Hollender, A. R.: Clinical Evaluation of Short Wave Diathermy in Otolaryngology, *M. Rec.* 145:376 (May 5) 1937.

Discussion

Dr. Anthony G. Sacco (Union City, N. J.): My first experience with short wave therapy three years ago was on a woman, 40 years of age who had for many years a copious and foul discharge from each nostril. Both antrums were black on transillumination. Each nostril had considerable free pus. The nasal septum was ulcerated extensively on either side. She was extremely nervous. She refused surgery of any kind and I could not tampon nor apply suction because the nose bled so easily and freely. I could only suggest short wave, infrared or autogenous vaccine. She was given three short wave radiations a week for three weeks and then twice a week, for two weeks, and was discharged cured after the fifth week. She has been well since. Naturally I became convinced of the value of short wave diathermy.

A bacteriologist and I experimented to find out what effect a use of two to three degrees of temperature would have on the growth of bacteria. He found none. He concluded that there was no specific action from short wave exposure. Apparently the effect is chiefly local heat to deep tissues, causing vasodilatation, which is a protective mechanism for dissipating the heat. This leads to an increase in the blood flow through the heated area, as well as in the capillary pressure, and acceleration in the transference of fluid from the blood with greater flow of lymph. Local heating leads to local blood changes and increased acidity. It is possible that there may be activation of the leukocytes; and metabolism of the local tissue. He

found no change in the red and white count, nor any effect on blood sedimentation and eosinophiles.

There is much work yet to be done so that we may arrive at a standard dose through different thicknesses of tissues; and different organs, and to determine the contraindications, the extent and duration of the application, and lastly any biochemical changes.

Short wave is a valuable adjunct to treatment of sinus disease, the results justifying its use. It has reduced the need for surgery. In chronic cases, the outcome is satisfactory unless there are considerable debris.

Dr. Farel Jouard (New York): There are two or three points that I should like to bring out. The essayist brought out clearly how, in his experience, short wave therapy seemed to give more satisfactory results in acute rather than chronic conditions. I think that is due to the fact that in acute conditions, we have rather functional disturbances. One may have some tissue disturbances, too, but they are secondary to the functional ones, while in the chronic conditions we have deep tissue changes and cannot expect such results in these deeper tissue changes as we do in the purely functional disturbances.

I remember the time when some of the rhinologists tried to use long wave diathermy in these acute sinus conditions and as a result, the consensus of opinion was against such therapy and eventually it was discarded; that is, we found that long wave diathermy applied to acutely in-

flamed sinuses, particularly in empyema, was not followed by beneficial results. However, when short wave diathermy came into use, it was found that even empyemas could be treated with benefit.

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